REMARKS

Claims 1, 3, 5, 8, 9, 13, 16-18, 22-24, 27, 28, 30, 32-34 and 38-49 were pending when the present Office Action was mailed September 9, 2008. In this response, claims 8, 13, 18, 24, 27, 32, 38 and 49 have been amended and no claims have been canceled. New claims 50-56 have been added. No new matter has been added by way of these amendments. Accordingly, claims 1, 3, 5, 8, 9, 13, 16-18, 22-24, 27, 28, 30, 32-34 and 38-56 are currently pending.

In the September 9, 2008 Office Action, claims 1, 3, 5, 8, 9, 13, 16-18, 22-24, 27, 28, 30, 32-34 and 38-49 were rejected and no claims have been allowed. More specifically, the status of the application in light of the Office Action is as follows:

1. The specification was objected to;
2. Claim 18 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicant regards as the invention;
3. Claims 1, 3, 8, 9, 13, 27, 28, 32, 38, 41 and 43-49 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,645,518 to Wagh *et al.* ("Wagh");
4. Claims 30, 33, 34, 39 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wagh.
5. Claims 1, 5, 40 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,846,894 to Singh *et al.* ("Singh"); and
6. Claims 16-18 and 22-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wagh in view of U.S. Patent Application No. 2003/0131759 to Francis *et al.* ("Francis").

Reconsideration and withdrawal of the rejections set forth in the Office Action dated September 9, 2008 are respectfully requested.

I. Amendments

The specification was amended to include the serial numbers of the application incorporated by reference at paragraph [0001] of page 2 of the Amendment to the

Specification, and at the paragraph at page 2, lines 21-33, and the paragraph at page 7, lines 22-27 of the original specification.

Claims 1-4, 12, 13, 17 and 22 have been amended solely for clarification, and not for purposes of overcoming any art.

No new matter has been added by way of these amendments.

II. Objections to the Specification

The Specification was objected to because the attempt to incorporate subject matter into the instant application by reference was ineffective (September 9, 2008 Office Action, page 2, paragraph 1). Specifically, the Examiner submits that the Specification is missing serial numbers of the referenced subject matter. Applicants submit herein an amendment to paragraph [0001] of page 2 of the Amendment to the Specification, and at the paragraphs at page 2, lines 21-33 and page 7, lines 22-27 of the original specification. Accordingly, Applicants request the objection to the Specification be withdrawn.

III. Rejections Under 35 U.S.C. § 112, second paragraph

Claim 18 was rejected under 35 U.S.C. §112, second paragraph as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicant regards as the invention. In particular, the Examiner requires clarification of which substance or mixture is being referred to by weight (September 9, 2008 Office Action, page 2, paragraph 4). Applicants have amended claim 18 to clarify that the solids content within the waste and water mixture, after the removal step, is of equal to or less than 90% measured by weight of the residual waste and water mixture.

Accordingly, Applicants respectfully request withdrawal of the rejection under 35 U.S.C. §112, second paragraph.

IV. Rejections Under 35 U.S.C. § 102

Claims 1, 3, 8, 9, 13, 27, 28, 32, 38, 41 and 43-49 were rejected under 35 U.S.C. §102 as allegedly being anticipated by U.S. Patent No. 5,645,518 to Wagh *et al.* ("Wagh").

These rejections are respectfully traversed for the following reasons.

A. The Present Claims

Independent claim 1 is directed to a method of stabilizing a waste in chemically bonded phosphate ceramic. The method includes preparing a slurry comprising the waste, water, an oxide binder and a phosphate binder. The method also includes allowing the slurry to cure to a solid hydrated chemically bonded phosphate ceramic matrix. The method further includes removing bound water from the solid hydrated chemically bonded phosphate ceramic matrix.

Independent claim 27, as amended, is directed to a method of stabilizing a waste in a chemically bonded phosphate ceramic. The method includes preparing a slurry comprising the waste, water, an oxide binder and a phosphate binder. The method also includes removing water from the slurry while at least one of mixing the slurry and allowing the slurry to cure.

B. The Applied Art

WAGH describes a method for stabilizing solid and liquid waste at room temperature that includes combining solid waste with an oxide and an acid solution to create a slurry. The slurry is shaped into a predetermined form (Abstract). Wagh teaches fabrication of chemically bonded phosphate ceramics at room temperature to stabilize mixed waste forms (Col. 1, lines 60-63).

C1(i). Analysis: The Legal Standard

The standard for lack of novelty, that is, for anticipation, is one of strict identity. To anticipate a claim for a patent, a single prior source must contain all its essential elements. M.P.E.P. § 2131.

C1(ii). Addressing the Examiner's Position on Wagh

Wagh fails to support a *prima facie* case for rejecting claim 1 under Section 102 for at least the reason that this reference fails to disclose or suggest several claimed features. For example, claim 1 requires allowing the slurry to cure to a solid hydrated chemically bonded phosphate ceramic matrix and removing bound water from the solid hydrated chemically bonded phosphate ceramic matrix. This feature is not shown or suggested by Wagh.

In the September 9, 2008 Office Action, the Examiner alleges that Wagh teaches all of the features of claim 1 (page 3, lines 5-12). Specifically, the Examiner alleges that Wagh teaches a method for stabilizing wastes using phosphate ceramic, water and an oxide binder, and further alleges that Wagh "teaches heating at 100°C" (Office Action, page 3, lines 6-8). The Examiner further reasons that "[i]t would be inherent that some water would evaporate in the solid hydrated chemically bonded phosphate ceramic matrix at 100°C" (Office Action, page 3, lines 11-12). Applicant respectfully disagrees. In contrast to the Examiner's reading, Wagh does not teach heating the slurry or a cured matrix at 100°C. Instead, Wagh teaches mixing the slurry while maintaining the slurry below 100°C (Wagh, claims 1 and 7; col. 6, lines 27-29). In fact, Wagh does not teach applying heat to the slurry, but discloses slow mixing and/or cooling the slurry reaction to maintain the temperature below 100°C (Wagh; col. 4, lines 16-21; col. 6, lines 27-36).

Furthermore, Wagh does not teach heating and/or removal of bound water from the solid matrix as required by claim 1. As described in the instant specification at page 3, lines 2-4, "[e]ach of the commonly formulated CBPCs is a hydrated ceramic product with water bound within the ceramic matrix." Stoichiometrically prepared MKP, prepared as discussed

in the instant specification page 7, lines 30-32, will have "six water molecules bound within the crystal matrix for each magnesium-potassium phosphate (MgKPO.sub.4) molecule", while "other MKP formulations can have as much as 22 molecules H_2O for each ceramic molecule" (page 3, lines 5-6) The specification further teaches that "the water bound within the CBPC matrix can compromise the stability and effectiveness of CBPC for stabilizing and encapsulating certain types of wastes" and "[t]he partial or complete dewatering of a hydrous CBPC waste form after it has cured will not reduce the final size of the cured form"...however, "the weight of the form will be reduced, and the effects of radiolysis can be minimized if the form has been used to encapsulate radioactive waste" (page 7, line 33 – page 8, line 1; page 11, lines 20-23). Accordingly, even if a small portion of the water in Wagh's slurry did evaporate during mixing at a temperature below 100°C, which the Applicants to not concede, the state of the water molecule, the process of water removal, and the final waste form would be different.

Wagh also fails to support a *prima facie* case for rejecting claim 27 under Section 102 for at least the reason that this reference fails to disclose or suggest several claimed features. For example, claim 27 requires removing water from the slurry while at least one of mixing the slurry and allowing the slurry to cure. This feature is not shown or suggested by Wagh. Moreover, Wagh teaches away from the features of this claim.

As discussed above, Wagh teaches mixing the slurry while maintaining the slurry below 100°C (Wagh, claims 1 and 7; col. 6, lines 27-29). In direct contrast to the Examiner's reading of the cited reference, Wagh describes cooling or slow mixing the reaction to maintain the slurry temperature below 100°C (Wagh; col. 4, lines 16-21; col. 6, lines 27-36). One of ordinary skill in the art would not find a mixing temperature below 100°C to inherently evaporate or otherwise remove water from the slurry while mixing or while allowing the slurry to cure. Moreover, as Wagh teaches away from the features of claim 27, a skilled artisan would not, upon reading Wagh, find the features of claim 27 to be obvious.

Accordingly, Wagh does not disclose all of the claimed features and/or teaches away from the methods as claimed in independent claims 1 and 27. Claims 3, 8, 9, 13, 28, 32, 38, 41 and 43-49 depend from otherwise allowable claim 1 and 27. Therefore, Applicants respectfully request that the Section 102 rejection of these claims be withdrawn for the reasons discussed above and for the additional features of these claims.

V. Rejections Under 35 U.S.C. § 103

Claims 30, 33, 34, 39 and 49 were rejected under 35 U.S.C. §103 as allegedly obvious over Wagh.

Claims 1, 5, 40 and 42 were rejected as allegedly obvious over U.S. Patent No. 5,846,894 to Singh *et al.* ("Singh").

Claims 16-18 and 22-24 were rejected as alleged obvious over Wagh in view of U.S. Patent Application No. 2003/0131759 to Francis *et al.* ("Francis").

As explained in greater detail below, the Office Action has failed to establish a *prima facie* case of obviousness with regard to these claims for at least the following reasons: (1) none of the applied references, alone or in combination, disclose or suggest all the claim elements, (2) the Office Action has failed to provide some articulated reasoning with rational underpinning to support the legal conclusion of obviousness, and (3) the applied references teach away from the proposed combination. Accordingly, the Section 103 rejections of claims 1, 5, 16-18, 22-24, 30, 33, 34, 39, 40, 42 and 49 should be withdrawn for at least these reasons.

A. The Present Claims

Independent claim 1 is directed to a method of stabilizing a waste in chemically bonded phosphate ceramic. The method includes preparing a slurry comprising the waste, water, an oxide binder and a phosphate binder. The method also includes allowing the slurry to cure to a solid hydrated chemically bonded phosphate ceramic matrix. The method

further includes removing bound water from the solid hydrated chemically bonded phosphate ceramic matrix.

Independent claim 16 is directed to a method of stabilizing a waste in chemically bonded phosphate ceramic. The method includes providing a mixture of the waste and water, and removing a select amount of water from the waste and water mixture to form a residual waste and water mixture. The method also includes preparing a slurry comprising the residual waste and water mixture, an oxide binder and a phosphate binder. The method further includes allowing the slurry to cure to a solid chemically bonded phosphate ceramic matrix.

Independent claim 27, as amended, is directed to a method of stabilizing a waste in a chemically bonded phosphate ceramic. The method includes preparing a slurry comprising the waste, water, an oxide binder and a phosphate binder. The method also includes removing water from the slurry while at least one of mixing the slurry and allowing the slurry to cure.

B. The Applied Art

WAGH describes a method for stabilizing solid and liquid waste at room temperature that includes combining solid waste with an oxide and an acid solution to create a slurry. The slurry is shaped into a predetermined form (Abstract). Wagh teaches fabrication of chemically bonded phosphate ceramics at room temperature to stabilize mixed waste forms (Wagh, col. 1, lines 60-63).

SINGH describes structural waste materials and methods of making structural waste materials for producing products such as blowable insulation, particles boards, packaging materials and bricks. (Singh; col. 3, lines 17-27). Singh discloses forming phosphate ceramic waste forms using reactions between oxides or hydroxides and phosphoric acid (Singh, col. 3, lines 28-36). Singh also discloses that the rate of oxide powder addition to the acid solution and/or reaction vessel cooling should be used to "result in a reaction liquor being maintained at less than 100°C" (Singh, col. 4, lines 58-67). Singh further discloses

that "[s]ludges and benign wastes with high water content can be incorporated...by appropriate modification to the water content in the acid" (Singh, col. 5, lines 14-16).

FRANCIS describes composite materials for use in pre-cast structures, coatings, rapid repair materials, and methods of producing such materials (Abstract). The materials are made from reactive compounds such as metal oxide, phosphate, reactive residual materials and water (Francis; Abstract; paragraphs [0011-0012] and [0038]; claim 1). In one embodiment, the reactive residual materials can include phosphate slime (clays, minerals and phosphates in a liquid such as water) (Francis, paragraph [0034]). The phosphate slime can be added to the composite mixture in a liquid or dried form (Francis, paragraph [0034]).

C1. Analysis: Rejection of Claims 30, 33, 34, 39 and 49 under Section 103 Based on Wagh

Rejections based on obviousness cannot be sustained with mere conclusory statements (M.P.E.P. § 2142), and to establish a *prima facie* case of obviousness, clear articulation of the reason(s) why the claimed invention would have been obvious must be explicit (M.P.E.P. § 2143). Further, the applied references must expressly or impliedly suggest the claimed invention or, if they do not, the Office Action must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the references (M.P.E.P. § 706.02(j)).

In the present case, the applied reference, either alone or in combination, does not disclose or suggest the claimed features. For example, the preceding discussion of the Section 102 rejections highlighted claim limitations that Wagh fails to teach. The Section 103 rejection of these claims is not proper because Wagh fails to teach or suggest all of the claimed features. For example, claims 30, 33 and 34 depend from independent claim 27, which includes the claimed feature of removing water from the slurry while at least one of mixing the slurry and allowing the slurry to cure.

In the September 9, 2008 Office Action, the Examiner alleges that Wagh teaches that the slurry is heated to a temperature of 100°C, and further asserts that "it would be inherent that some water would evaporate..." (Office Action, page 3, lines 5-12; page 4, lines 3-5). Instead, Applicants submit that the process disclosed and taught by Wagh does not include heating the slurry to a temperature of 100°C, nor does Wagh teach removing water, through evaporation or otherwise, from the slurry during mixing or curing (Wagh, (Wagh, claims 1 and 7; col. 6, lines 27-29). As nothing in Wagh suggests how one might remove water from the slurry, claim 27 is patentable over Wagh. As claims 30, 33 and 34 depend from claim 27, these claims are also patentable over Wagh for at least this reason.

Claims 39 and 49 depend from independent claim 1, which includes the claimed feature of removing bound water from the solid hydrated chemically bonded phosphate ceramic matrix. As discussed above with respect to the section 102 rejection of claim 1, Wagh does not teach removing bound water from a solid hydrated chemically bonded phosphate ceramic matrix. As taught in the instant specification, water molecules are bound within the crystal matrix when the slurry is allowed to cure. Nothing in Wagh describes such bound water or suggests how one might remove bound water from the solid hydrated chemically bonded phosphate ceramic matrix. As both the process as well as the product formed from the process of claim 1 differs from Wagh, claim 1 is patentable over Wagh. As claims 39 and 49 depend from claim 1, these claims are also patentable over Wagh for at least this reason and for the additional features of these claims.

C2. Analysis: Rejection of Claims 1, 5, 40 and 42 under Section 103 Based on Singh

Rejections based on obviousness cannot be sustained with mere conclusory statements (M.P.E.P. § 2142), and to establish a *prima facie* case of obviousness, clear articulation of the reason(s) why the claimed invention would have been obvious must be explicit (M.P.E.P. § 2143). Further, the applied references must expressly or impliedly suggest the claimed invention or, if they do not, the Office Action must present a convincing

line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the references (M.P.E.P. § 706.02(j)).

In the present case, the applied reference does not disclose or suggest the claimed features. Claim 1 includes the claimed feature of removing bound water from the solid hydrated chemically bonded phosphate ceramic matrix. Singh describes phosphate ceramic waste forms using reactions between oxides or hydroxides and phosphoric acid (Singh, col. 3, lines 28-36), and further discloses that "[s]ludges and benign wastes with high water content can be incorporated...by appropriate modification to the water content in the acid" (Singh, col. 5, lines 14-16). The Examiner concedes that Singh does not teach removing bound water from the solid hydrated chemically bonded phosphate ceramic matrix; however, the Examiner asserts that because Singh teaches adjusting the water added to the slurry based on the water content of the waste material, that it would have been obvious "to expel overflow water from the slurry in order to form the solid" (September 9, 2008 Office Action, page 7, ¶s 2-4). The Applicants respectfully disagree.

As discussed above with respect to the section 102 rejection of claim 1, the partial or complete dewatering of a solid hydrated chemically bonded phosphate ceramic matrix after it has cured will not reduce the final size (e.g., volume) of the cured form, but will reduce the final weight of the cured form (page 11, lines 20-23). Furthermore, because bound water is removed from the already cured waste form, the effects of radiolysis can be minimized if the form has been used to encapsulate radioactive waste" (page 11, lines 22-23). In contrast, adjustment of water added to the slurry, as taught by Singh, would not yield a product waste form having removed bound water. Stoichiometrically prepared chemically bonded phosphate ceramics will have water molecules bound within the crystal matrix of each ceramic molecule (page 3, lines 1-6). Accordingly, the cured chemically bonded phosphate ceramic waste form of Singh will contain these bound water molecules even if the initial water content of the acid is adjusted prior to addition to the slurry in order to accommodate a waste having high water content (Singh, col. 5, lines 14-16). Accordingly, Applicants

respectfully submit that Singh fails to support a *prima facie* case of obviousness, and respectfully request that the Section 103 rejection of claim 1 be withdrawn.

Claim 5, 40 and 42 depend from allowable claim 1. Therefore, these claims are patentable over Singh for the reasons discussed above and for the additional features of these claims. Applicants respectfully request that the Section 103 rejection of these claims be withdrawn.

C3. Analysis: Rejection of Claims 16-18 and 22-24 under Section 103 Based on Wagh and Francis

Rejections based on obviousness cannot be sustained with mere conclusory statements (M.P.E.P. § 2142), and to establish a *prima facie* case of obviousness, clear articulation of the reason(s) why the claimed invention would have been obvious must be explicit (M.P.E.P. § 2143). Further, the applied references must expressly or impliedly suggest the claimed invention or, if they do not, the Office Action must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the references (M.P.E.P. § 706.02(j)).

In the present case, the applied references do not disclose or suggest the claimed features. Claim 16 includes the claimed features of removing a select amount of water from the waste and water mixture to form a residual waste and water mixture, and preparing a slurry comprising the residual waste and water mixture, an oxide binder and a phosphate binder. Wagh describes combining solid waste with an oxide and an acid solution to create a slurry (Wagh, Abstract). Francis describes forming composite materials from metal oxide, phosphate, reactive residual materials and water (Francis, Abstract; paragraphs [0011-0012] and [0038]; claim 1). The Examiner concedes that Wagh does not teach removing water from the waste prior to making the slurry, he asserts that Wagh does teach heating the composition to 100°C, thereby removing water (September 9, 2009 Office Action, page 8, ¶ 2). The Examiner further relies on Francis to teach removing excess water prior to formation of the slurry (*Id.*, page 8, ¶ 3). The Applicants respectfully disagree.

As discussed above, Wagh does not teach heating a slurry composition to 100°C or teach removing water from the slurry. While the Examiner points to Francis at paragraph [0034], which states that the phosphate slime may be dried prior to use, to support his claim, he appears to have ignored the rest of the disclosure which specifically teaches adding water to the reactants regardless of the source of the reactive residual material (see paragraphs [0038], [0042]). Furthermore, if the phosphate slime is not dried prior to use, further water addition may be limited accordingly (see Francis, Table 3). Moreover, Francis does not teach removing a "select amount of water from the waste and water mixture to form a residual waste and water mixture" as required by claim 16. In contrast, Francis teaches that the phosphate slime can be added to the slurry in liquid form or a dried form, and that further water addition is added and/or adjusted accordingly so that the water content in the reaction slurry is maintained. Accordingly, since the combined teachings of the cited documents fail to show or suggest all of the claim elements, the Applicants respectfully request withdrawal of the rejection under 35 U.S.C. §103.

Claims 17, 18 and 22-24 depend from otherwise allowable claim 16. Accordingly, the Section 103 rejections of these claims should be withdrawn for the reasons discussed above and for the additional features of these claims.

VI. New Claims 50-56

New claims 50-56 have been added. Claims 50, 51, 52 and 53 depend from otherwise allowable claims 1, 3, 16 and 27, respectively, and are fully supported in the specification as originally filed. Independent claim 54 is similar to independent claims 1, 16, and 27 and support for these features may be found throughout the specification. Claims 55 and 56 depend from independent claim 54, and support for these claims can be found in the specification as originally filed.

VII. Conclusion

In light of the foregoing amendments and remarks, the Applicants respectfully request reconsideration of this application. If the Examiner becomes aware of any issues that may be expediently handled by telephone, the Examiner is encouraged to contact the undersigned representative by telephone at (206) 359-8000 to resolve such matters.

Please charge any deficiencies or credit any overpayment to our Deposit Account No. 50-0665, under Order No. 166538025US1 from which the undersigned is authorized to draw.

Dated: 12-8-08

Respectfully submitted,

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